Weatherwise

Weather Stations in the Far North

A Flight in Search of Ice Islands

Skijump Operations

The Arctic Institute of North America

The Yukon River Breakup of 1952

Vol. 5, No. 4, August, 1952

"SOME PEOPLE ARE WEATHERWISE BUT MOST ARE OTHERWISE" – BENJAMIN FRANKLIN

WEATHERWISE

THE MAGAZINE ABOUT WEATHER

DAVID M. LUDLUM, *Managing Editor* — CHARLES A. FEDERER, JR., *Editor*
HANS H. NEUBERGER, *Technical Editor* — D. C. CAMERON, *Research Associate*
ERIC SLOANE, *Art Director*

LETTERS TO THE EDITOR

Sir:

At five o'clock in the afternoon of March 22nd, I was standing by my instrument shelter, getting ready to take a reading. The day had been low-cloudy, with considerable rain during the previous night and morning; during the afternoon heavy fog had set in, but there had been no rain since 3 p.m.

Just before five, a few distant peals of thunder were heard, and the fog lifted a little. Then, just as I reached for the key to the shelter, what appeared to be two simultaneous bolts of lightning struck within the southwest quadrant from the shelter, splintering the midsections of two trees, a poplar and a locust, about 15 yards apart and roughly 30 yards from where I was standing. I felt a light shock in my right leg, and upon investigation found that the lightning had apparently moved toward me after reaching the ground.

In the exact direction of my location a series of furrows appeared. The first, about five yards long, began near the stricken poplar; it was such a furrow as would have been made with a small turning plow. Within the next few yards there were two or three gouges in the ground; then a scratch at right angles, such as might be made by drawing a spade along edgewise. Then about 10 yards nearer was another small, shallow furrow, first at right angles, but turning until it pointed precisely at my position. It faded out about 10 yards from me and the instrument shelter.

A thorough examination of a 50-yard circle around the stricken trees revealed no furrows except those that came my way. Both trees were so badly splintered that they blew down later that night.

BARRY C. HAWKINS
Rock House, N. C.

ED. NOTE: Mr. Hawkins is a co-operative weather observer, one of four in the United States who have completed 60 years of service.

Sir:

I was on duty alone at the Interstate Airway Communications station the evening of March 21, 1952, and witnessed a direct hit of a tornado upon the structures of the airport at Dyersburg, Tennessee.

This twister was spawned from the southeastern edge of the counterclockwise winds around a low pressure system centered over northeastern Arkansas and southeastern Missouri. It was first seen, at the time of the hourly weather observation at 8:30 p.m., on the west-southwest horizon as an ebony silhouette like that of an American bald eagle. The base was the only part clearly visible due to a cumulonimbus top ahead of it containing continuous vivid lightning. The windows facing east were slight-

(Continued on page 89)

Vol. 5, No. 4 — August, 1952

CONTENTS

Weather Stations in the Far North — R. B. Sykes, Jr. 75

A Flight in Search of Ice Islands — Maynard M. Miller 78

Skijump Operations — W. V. Kielhorn and C. A. Palmer, Jr. 83

The Arctic Institute of North America — Walter A. Wood 85

The Yukon River Breakup of 1952 — Robert O. Cole 88

May Rains and June Heat 90

Workshop for Weathermen — An Easily Constructed Remote Temperature-Indicating Device — Clarence A. Woollum .. 93

Cover: Late spring in the Arctic, where U. S. and Canadian weather observers manning one of five jointly operated stations are cutting a hole in the snow to measure its depth. Later, ice thickness will also be checked. USWB photograph. (See page 75.)

WEATHERWISE is published bimonthly for the American Meteorological Society. Office of publication, 3 Joy St., Boston 8, Mass. Subscription is $3.00 per year; add 50 cents for postage to Canada and all countries in the Pan-American Postal Union; add $1.00 for all other foreign countries. Subscription orders, claims for missing numbers, changes of address, and advertising correspondence should be addressed to the society at 3 Joy St., Boston 8, Mass. **Editorial offices:** Franklin Institute, Philadelphia 3, Pa.

Weather Stations in the Far North

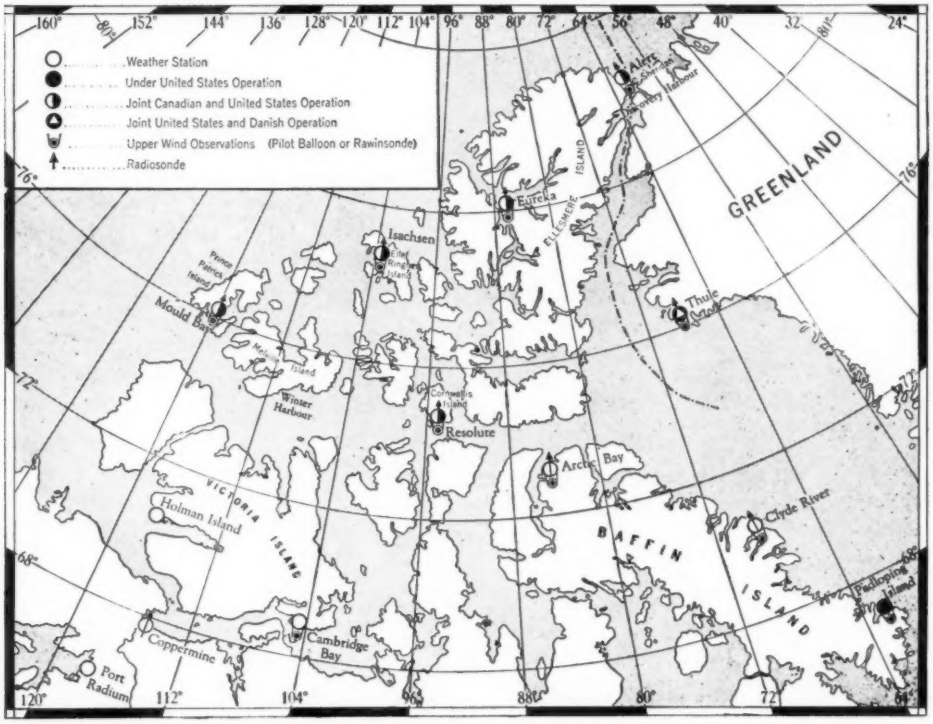
R. B. SYKES, JR., ARCTIC PROJECT, U. S. WEATHER BUREAU

FOR THE PAST FIVE YEARS the United States and Canada have been carrying out a joint program for the installation and operation of weather stations in the most northern part of this continent. There are five such stations, Alert, Eureka, Isachsen, Mould Bay, and Resolute, shown on the accompanying chart.

Bringing such a program into existence has not been the exclusive work of any one governmental group. In the United States the Weather Bureau, Air Force, Navy, and Coast Guard have participated directly. The Canadian Meteorological Office of the Department of Transport and the Royal Canadian Air Force have taken part for Canada. Naturally, since this is a weather station program, the two meteorological services have spearheaded the drive to bring these stations into operation and to plan their continuance. The other groups have made possible reconnaissance, transportation, and related assistance so necessary to these remote and very isolated places.

Consider, for example, Alert, the most northerly of the five stations, situated at latitude 82° 30′ 06″ north, longitude 62° 19′ 47″ west. Here Canada operates the most northerly post office of the world's land masses, since only a small part of Ellesmere Island, the northern 60 miles of Greenland, and a few miles of the arctic waste islands of Eurasia lie farther north.

Alert, together with Eureka and Resolute, may expect mail delivery by icebreaker during the summer, but Mould Bay and Isachsen can



Among the weather stations of the Far North shown here are five operated jointly by Canada and the United States. The map is reproduced from *Arctic*, published by the Arctic Institute of North America.

This mail from Canada and the United States has come in by parachute.

only look forward to paradrop. These small spots of human existence are difficult to find in both summer and winter, and a paradrop operation (as in the case of one in July, 1950, when a fatal accident occurred, including among those lost C. J. Hubbard, who was very instrumental in bringing the joint program into existence) is still not a commonplace activity. Mail tends to improve already high spirits which exist through the period of the long sunny days, 24 hours of sunlight. Also, the summer is a busy time of preparation for the coming winter as well as the time for making improvements. Station areas are largely free of snow, and winter seems pretty remote, despite an occasional summer snowstorm. In the other seasons too, mail is a vital morale factor, the more so as the year proceeds into winter and darkness. The stations do have radio contact with the "happy southland" and may hear from families from time to time.

Alert is of interest also because it is in an area rich in the recent history of arctic exploration. Peary based nearby for his north pole sprint, but the station derived its name from an expedition dating back to 1875. Two vessels of Sir George Nares' expedition, *Alert* and *Discovery*, sheltered in north Ellesmere. The *Alert* had fought northward to about 82° 24′ and was beset for the winter near Cape Sheridan. From here explorations were made by dog sledge, toward the west along the north Ellesmere coast and toward the east to northern Greenland. As one might expect, important contributions to the knowledge of these areas resulted.

Such a location could not be overlooked in siting a new weather station. During the summer of 1948 some advance reconnaissance was effected by icebreaker, and later some initial supplies, temporary structures, and equipment were cached. Further reconnaissance by air in 1949 showed surface conditions similar to those seen in 1948. In locating a site for a station, it is essential to consider the representativeness of weather observations, the availability of fresh water, possibilities for emergency evacuations of personnel, and ease of access to install and later to resupply.

Actual establishment of Alert was not undertaken until 1950. The airlift operation was carried out by the U. S. Air Force and the Royal Canadian Air Force. The initial landings, on Easter Sunday, brought in survey personnel and some of the station personnel. These landings were made by ski aircraft; it was necessary to improve the ice surface before the rest of the equipment, supplies, and personnel could be brought in by wheeled aircraft. After the airlift, a small group of men remained to continue the setting up of the station. During the summer of 1950, some additional personnel and equipment arrived by icebreaker, thus making it possible to have an operating upper-air and surface weather station by early fall.

The staff of technicians at this station, as at the others, consists of Canadian and American civilians. Qualified weather and radio technicians, together with skilled mechanics

A shelter for upper-air wind equipment. The SCR-658 needs a building with a radius of about 14 feet. The shape of the building aids equipment performance and reduces wind resistance. The structure is heated with coal, a pile of which may be seen on the right.

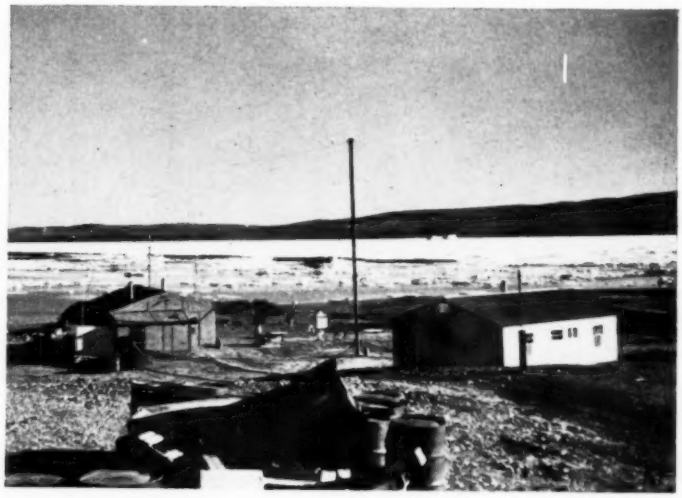
and cooks, make possible the efficient functioning of such isolated places. Personnel perform their duties as a unit. Everyone lives together, works together, eats the same food, dresses similarly, talks the same language.

At Alert (and programs at other stations are similar), a full weather observing program is accomplished the year around. Surface weather observations are taken at 3-hour intervals, rawinsonde releases are made twice daily, and pilot balloon ascents are also tracked twice a day. The station uses what is known as an SCR-658 high-frequency direction finder together with a double installation of Leeds and Northrup Speedomax radiosonde recorders. USWB procedures and instructions are used for upper-air observations, and Canadian for surface weather observations.

Since the primary function is the observation of weather conditions, the technique of transmitting these data promptly by radio has received particular consideration. The data are placed on the teletype circuits of Canada and the United States. The loss of transmissions from the stations has been remarkably low. A glance at a weather map of North America will show how important is the regular reception from these points covering so wide an area.

In addition to the routine weather reporting, some special scientific observations are made. For example, measurements of bay ice thickness and temperature profiles through the ice and the underlying water are taken regularly (see the front cover).

Of course, careful track is kept of animal and bird life. Although the climate is comparatively cold, it is surprising what quantity and diversity of flora and fauna exist. One can expect to see many forms of grass and flowers. In the summer, together with an assortment of birds, musk oxen, polar bears, foxes, and hares, there are wolves, sometimes in packs of 50 or more. The arctic hare has been seen in such quantities that over a hundred have been counted on a single hillside. Generally these various forms of life are quite unafraid of man and afford wonderful opportunities for study. These weather stations are located in an arctic game preserve area. For this reason Canadian game wardens are appointed at each station; each warden is sworn in by a Royal Canadian Mounted Police officer on his regular patrol.



A summer view of an arctic station, showing the cache of diesel fuel in the foreground. To the right is the barracks, and to the left the operations building, where the station staff also takes its meals.

Whereas temperatures averaging between 30° and 45° below zero are common in the winter part of the year, from June through August a comfortable 40° to 50° above zero is the rule. Higher temperatures are experienced in sheltered places having good exposure to the sun. On the other hand, locations near the frequently ice-filled waters are somewhat cooler and subject to the land-sea-

(Continued on page 84)

This U. S. Air Force photograph of a glacier on northern Ellesmere Island shows the same corrugations that are characteristic of the ice islands. The lower end of the glacier is fast to the sea ice. Presumably, ice islands break off in regions like this one.

A Flight in Search of Ice Islands

MAYNARD M. MILLER

ON August 1 and 2, 1951, Terris Moore, president of the University of Alaska, and I took part in an Air Force B-29 flight to Ellesmere Island and from there northward to the vicinity of the geographic pole in search of the so-called *floating ice islands* in the polar sea. We took off from Eielson Field in mid-morning on August 1st. Heading out across the broken and sporadic ice of the Beaufort Sea, we flew in clearing weather and could see that the waters of the Arctic Ocean for a distance of 40 or 50 miles off the mainland of Alaska were quite free of floes. Drift ice persisted between latitudes 71° and 72° north, and gradually we entered a zone of closer pack and field ice up to 74° N. For purposes of definition, *pack ice* is simply a general term for sea ice that has drifted from its original position, and *drift ice* is very open pack ice, where water predominates over ice. Arctic observers also refer to variants of pack ice as field ice, close pack, open pack.

Flying at about 10,000 feet, instead of the usual 18,000 adhered to by the routine weather missions, we were in and out of

cloud banks until, about 100 miles off Cape Prince Albert at the northwestern point of Banks Island, visibility downward became completely obscured.

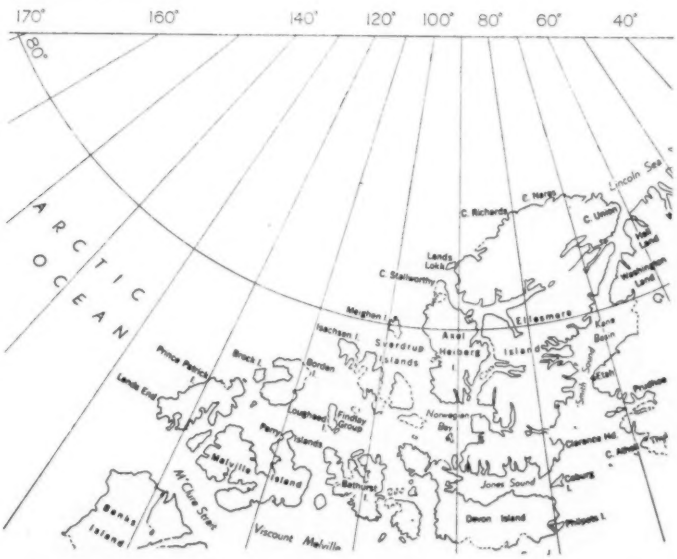
Our plan was to skirt along the Arctic Ocean coastline of Prince Patrick, Brock, and North Borden islands to reach Cape Isachsen at the northwestern tip of Ellef Ringnes Island. This we did without incident, flying through a nearly solid cloud deck, with only an occasional glimpse of tight-laced pack and field ice pressed against the brown and desert-like shores. We could see the patterns on the ground produced by frost action and summer melting, and could discern that these seldom-seen islands were low-surfaced and relatively gentle land masses and not much glaciated at the present time.

Because of the cloud cover we feared that by the time we reached Peary Channel our hoped-for view of Ellesmere Island off to the northeast would likewise be obscured. But more than a month of scanning weather reports received by the Arctic Weather Central via the high-latitude stations from Mould Bay to Alert (see the article on page 75) had given promise for this particular day.

In the vicinity of Meighen Island at 80° N., Capt. P. H. Bass swung the plane to a more northerly course in order to pass over Rens Fiord at the western tip of Axel Heiberg Island. About this time there appeared on the horizon one or two hundred miles ahead a startling view of brown, snow-crested highlands, glistening with glaciers. These were the Challenger Mountains and other ranges of Ellesmere Island. Our hopes were realized, for we saw everything now under a magnificent clear blue sky, unusually perfect weather for this region.

During the following two hours our aircraft traversed and circled the deeply cut and narrow re-entrants of fiords and glaciers along this vast and spectacular Ellesmere coast. Between Phillips Bay and Markham Bay, along the edge of the polar sea, was an unmistakable fringe of very interesting land-fast ice, intermittent in character and indented in places where the moving pack was brought in contact with raised beaches and bedrock. But elsewhere, especially between Yelverton Bay and Disraeli Bay, we could see 50 or more miles of continuous ice shelf, some of it extending offshore 10 to 15 miles. All of this ice shelf had a striking series of low surface undulations with their axes running northeast, most of them strangely parallel to the trend of the outer coastline. This welt-and-furrow effect looked like a gigantic plowed field with clean snow on the ridges, and blue ice and melt-water showing as long dark lines in the depressions.

Twenty miles north of Ward Hunt Island we found what we had come for. There,



The region of the Arctic over which the Ptarmigan flight of August 1-2, 1951, was made in search of ice islands. This is a portion of a map drawn at the Geographical Bureau, Ottawa. Refer also to maps on pages 75 and 84.

within sight of land and drifting free in the shifting maze of pack ice, was a huge unmistakable chunk of triangular-shaped flattish ice, about 23 by 20 miles. The surface showed the same peculiar corrugations as had the land-fast ice shelf along the nearby coast. Here was one of the large tabular bodies of ice reported during the past few years in the polar sea and christened, for want of a better name, floating ice islands. Capt. Lawrence Koenig, from photographs, identified the "island" as T-1, which had been lost to view for two years.

After making several low passes over the ice — one only 100 feet above the surface for photographic purposes — we headed north, and settled down for two hours of uneventful flying. We hoped to relocate T-2, another and even larger ice island last sighted the month before, in the polar sea between Cape Columbia and the pole. Between latitudes 83° and 85° we passed over the tightest pack ice yet seen on the flight — giant floes and much pressure-ridging were everywhere we looked.

North of 85° we encountered another broad area of disappointingly thick and solid undercast, but pushed our search for another hour. It was then three hours to midnight, Alaska time, and we had been in the air 11 hours. Soon the plane would reach the outer limit of safety imposed by its fuel supply, and we would be forced to turn back on a direct nine-hour line to Pt. Barrow, at the northern tip of Alaska.

But a series of breaks came in the undercast, followed by a cold front at 87° N. Beyond, light from the midnight sun gleamed in reflection from the flat white and slightly broken pack. I was interested to see that so near the pole there should be so many leads of open water. Our hopes for finding the second island faded when the navigator, Capt. D. P. Bloom, decided that our fuel limit had been reached and we must head for home.

Three miles away lay an endless solid fog bank, and I swept the horizon again with my binoculars before we once more plunged into the mist. On our starboard beam a slight nonconformity caught my eye, a whiter patch that differed in texture from the surrounding pack. The plane veered off its course and soon we could pick it out more clearly. We were closing on T-2.

At that moment we were about 150 miles from the pole, and due north of Peary Land at the upper tip of Greenland. As we swooped down for a closer look, Capt. Koenig was again able to make identification sure with his photographs. Roughly circular in outline, T-2 is about 400 to 500 square miles in area, with the characteristic linear surface structure we noticed on T-1 and on the ice shelf of Ellesmere.

There was enough fuel for one low pass, and to make it a really good one, the pilot brought us down within 50 feet of the surface. We crossed the "island's" 25-mile width and circled upward again for a last look. Two large seals slithered off the ice into a lead of

T-2 lies beyond the open water in this picture, its surface standing about 20 feet above the level of the sea. Note the melt water rivulets on the surface of the ice island. Official U. S. Air Force photograph.

This low-level photograph of ice island T-3 shows the corrugated surface and the difference between the ice pack and the floating island. Compare this with the picture on page 78. Official U. S. Air Force photograph.

open water along the low frontal cliff.

The B-29 then climbed to 10,000 feet and leveled off for home. Eight hours later we broke out of the murk so characteristic of the summer months in the central polar basin, and landed on the short gravel airstrip at Barter Island, close to the Alaskan coast. It was 6 a.m. August 2nd, and we had two hours and 20 minutes of gasoline left. We had flown nonstop for 19 hours and 55 minutes, the longest Ptarmigan flight (the name applied to long-distance polar missions) in the total of more than 500 flights completed up to that time.

A few hours later we were airborne again, and when the letdown came at Eielson Field, Terry Moore and I both knew we were completely fatigued. Yet the pilots calmly landed the plane after the memorable 4,100-mile journey.

This interesting flight was made at the invitation of Lt. Col. Joseph O. Fletcher, commanding officer of the 58th Strategic (Weather) Reconnaissance Squadron at Eielson Air Force Base. Capt. Koenig is the squadron's weather and ice reconnaissance officer.* The flight plan had initially been suggested by Col. Marcellus Duffy, commanding officer of the Arctic Weather Central of the Air Weather Service, who had been most helpful and interested in the meteorological program of the American Geographical Society's Juneau Ice Field research project, in which I was engaged in southeastern Alaska. I was asked to go along on the flight in the hope that I might provide some glaciological interpretations.

I believe we can now say that the fringing ice shelf of northern Ellesmere Island gave birth to the giant floating masses of solid ice that we sighted. T-1 was first discovered more than six years ago 300 miles north of Alaska, and was tracked for four years as it drifted more than 2,000 miles, beyond the pole and into the Lincoln Sea. The second and larger ice island was seen first in July, 1950, and in a year had drifted directly across the pole to the position 200 miles from the pole where we found it.

A third large body of ice and several smaller ones have also been sighted by Air Force pilots. This large one, too, is drifting

*Members of the aircraft crew were Capt. P. H. Bass, pilot; 1st Lt. N. J. McSwane, co-pilot; Capt. D. P. Bloom, navigator; 1st Lt. A. S. LeJoie, Jr., navigator; 1st Lt. R. T. McFalls, radar observer; Sgt. E. W. Miller, chief engineer; T/Sgt. R. C. Campbell, assistant engineer; S/Sgt. C. H. Penn, radio operator; Cpl. B. J. Cook, meteorologist; Cpl. P. P. Jones, radio operator; Sgt. C. Bennet, photographer.

at the rate of from one to three miles a day and, like the other two big ones, apparently follows the irresistible sweep of the giant Beaufort eddy which swings clockwise from the northern coast of Alaska toward the pole, eastward to Greenland and the Ellesmere shore, and thence south and west along the Canadian archipelago and again across the Beaufort Sea to Alaska.

From their birthplace on the ice shelf fringe of Ellesmere, these ice masses have broken free and drifted westward with the current of the Arctic Ocean, from Canadian to Alaskan and possibly to Siberian waters, and eventually back again to the neighborhood of northern Greenland. They may have been floating for scores of years. How many turns they have made in this giant, slow-moving whirlpool is a matter of conjecture, as are the answers to many related questions.

Some of the answers can be found from a detailed study of features of the "islands"—their movement, their internal and external nature, and their origin. Basing my judgment on a provisional comparison with certain antarctic tabular icebergs, the arctic ice islands appear to be between 100 and 300 feet thick and 10 to 25 feet above the sea at the highest edge.

In March of this year, Gen. William D. Old, commanding general of the Alaskan Air Command, authorized the experimental landing of an Air Force plane on one of the "islands." On the first flight he participated as co-pilot, with Col. Fletcher in charge of operations. This expedition was widely reported in the press.

The result has been the establishment of a weather station about 100 miles from the north pole, already providing valuable meteorological records to supplement the other arctic stations. We can look forward with great interest to a detailed study of the ice islands.

HEAT AND DEATH RATES

The three-day heat wave in June increased the death rate in New York City by 77 per cent, according to Health Department figures reported in the New York *Times*.

"Statistics concerning the relationship between heat waves and death rates are important scientifically to determine precisely what the danger degree of heat is and what other factors, if any, are related, so that the public may be warned about the risk involved during such periods," a spokesman from the Department of Health explained.

For the first 24 days of June, the average number of deaths reported daily was 213. For June 25-27, however, the average rate soared to 376 as the thermometer recorded 90° temperatures.

Most people who succumb during protracted heat waves are the very young, the very old, and the chronically ill, according to the statistics. The study shows that the daily average number of fatalities among persons 65 years or older rose from 103 for the first 24 days of June to 210 during the heat wave.

The next largest increase occurred in the 45- to 64-year-old age group, and a considerable death-rate climb was noted for infants under one year. There was no change in the rate for those between five and 24.

The Health Department said that in the greater heat wave of August, 1948, the number of deaths tripled the usual average. Other heat waves severe enough to increase the death rate markedly occurred in June, 1925, and in the summer of 1937.

NEW FORECAST CENTER

A plan designed to bring the theoretical worker into closer contact with the practical forecaster was announced at the Washington meeting of the American Meteorological Society.

Dr. F. W. Reichelderfer, chief of the Weather Bureau, announced that his organization and the University of Chicago would co-operate in a new type of forecast center; the Chicago District Forecast Center of the Weather Bureau will soon move to the University of Chicago campus, where the regular forecasters will work with the research forecasting section of the department of meteorology.

The Chicago experiment was discussed at length in a symposium devoted to the problem of closer co-ordination of meteorological research and weather forecasting.

SKIJUMP OPERATIONS

W. V. KIELHORN AND C. A. PALMER, JR.
GEOPHYSICS BRANCH, OFFICE OF NAVAL RESEARCH

DURING FEBRUARY of this year, the United States Navy repeated, on a much larger scale, the investigations of the Arctic Ocean which commenced last year in the preliminary operation known as Skijump I. These two operations were an outgrowth of plans of the Geophysics Branch of the Office of Naval Research to investigate the oceanography of the Arctic Ocean.

Last year, a single Douglas DC-3, fitted with ski-wheel combinations and equipped as a flying laboratory, landed at various places on the frozen Arctic Ocean to determine the feasibility of conducting winter oceanographic investigations. The results of this one-plane expedition were so gratifying that the second and larger expedition was organized for the early months of this year.

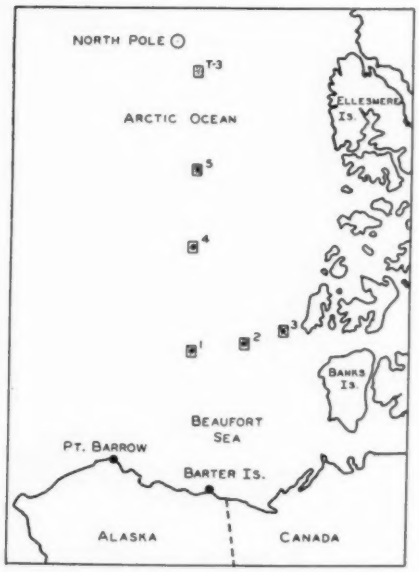
The Navy's Bureau of Aeronautics made available two Lockheed Neptunes fitted with ski-wheel combinations and the same Douglas DC-3 (known in the Navy as an R-4-D) that was used last year. The last months of 1951 were spent in exhaustive and time-consuming detailed planning. Five hundred miles out on the arctic ice is not a good place to find that some vital piece of equipment has been left behind!

Comdr. Vernon J. Coley, U. S. Navy, was appointed officer-in-charge of the expedition. The scientists on the project were W. V. Kielhorn, of the Office of Naval Research, and Mr. and Mrs. John Holmes and Val Worthington, of the Woods Hole Oceanographic Institute.

While any expedition to the Arctic or Antarctic has overtones of high adventure, the primary purpose of Skijump II was to obtain geophysical data on the Arctic Ocean. This purpose was accomplished by landing the DC-3 on the polar ice cap and using it as a laboratory for making various oceanographic and meteorological measurements. The Neptunes were used as flying tankers to extend the range of the DC-3 and to fly cover.

It was necessary for the DC-3 airplane used in Operation Skijump to practice touch-and-go landings to test the ability of the pack ice to support the 29,000-pound weight of the flying "frigid laboratory." After a ski landing, the research party would leave the plane to conduct the ice soundings. Official U. S. Navy photograph.

Five stations were occupied. Holes were cut through the ice using chain saws and post-hole augers, and oceanographic instruments were lowered through the ice to obtain temperature, salinity, and current data.



This map shows the approximate locations in the Arctic Ocean where landings of Operation Skijump II were made during the early months of 1952. The landings are numbered from 1 to 5, and the location of ice island T-3, near the north pole, is included.

This oceanographic phase of the expedition was cut short with the crash of the DC-3 on takeoff at Station 5 on March 27th. The landing gear was wrecked beyond repair, and the plane was abandoned. The scientists, officers, and crew were picked up on March 30th by one of the Neptunes. The long preliminary planning paid off during the three days that the personnel had to stay on the ice, using only the survival gear available in the plane.

The data gathered on Skijump II are now being analyzed by the scientific staff at Woods Hole. Several preliminary results, however, promise to change some long-cherished ideas regarding the Arctic Ocean. One of the most interesting observations was that apparently there was no current in deep water relative to the ice at the time the stations were occupied. The soundings also indicated depths greater than had been expected in this area.

Thus, as more and more information becomes available, we are learning to understand and use one of our last geographical frontiers. Future ability to obtain meteorological and oceanographic information in the arctic regions may make more accurate weather forecasts possible.

WEATHER STATIONS IN THE FAR NORTH

(Continued from page 77)

breeze effect. The comparatively large amount of open water in and around these arctic islands means, of course, that fog and stratus are quite common during the summer, particularly at places near the coasts of the islands. Since the stations have been established, the absolute minimum temperatures during a winter have generally been between 50° and 60° below zero. This is not, of course, as cold as is experienced in more continental parts of the Arctic. Summer or winter, properly clothed and suitably provided with shelter, personnel at these arctic stations live in comparative comfort.

The arctic regions have for many years been a challenge to the meteorologist. Modern developments in transportation, communications, and data-gathering have made possible a practical attack on those phases of arctic conditions which have remained little known. The meteorological observations contribute to day-to-day forecasting as well as to extended-period forecasting and the improvement of long-range forecasting techniques. The accumulation of systematic climatological records provides specific information for needed research. The joint Canadian-U. S. arctic program is helping to reduce the weather unknowns in the North American Arctic.

LIGHTNING CONDUCTOR

The Empire State Building in New York City has been hit by lightning 226 times in the past 10 years, drawing charges from as far away as 10 miles, according to a Science Service release.

J. H. Hagenguth and J. G. Anderson, reporting to the American Institute of Electrical Engineers, said, however, that there is little danger to workers inside the building.

The Arctic Institute of North America

WALTER A. WOOD, ARCTIC INSTITUTE OF NORTH AMERICA

IN RECENT YEARS the Far North has vastly increased in importance in its relation to the rest of the world. With the advent of long-range aircraft and improved surface transportation in the Arctic, this region has become accessible to a degree undreamed of a few years ago.

Commercially and strategically, the North American Arctic and Subarctic have become internationally significant. In addition, this area covering all of Alaska and Greenland and 80 per cent of Canada holds promise of economic benefits for the entire continent. Its resources of oil, coal, radium, uranium, and other minerals are largely unknown, and little developed; it is an important source of fish and fur.

The Arctic offers, moreover, many answers to fundamental questions in science, of ultimate value to all mankind. North American weather is often "born" in the Arctic, but the influences on weather of various northern phenomena, such as the refrigerating effects of land ice masses and the varying extent of open water in arctic seas, are not fully understood. Further knowledge of these and other phenomena would greatly aid short- and long-term weather forecasting.

It was the simultaneous recognition on the part of scientists in the United States and Canada of the importance of Arctic North America, and of the need for a co-ordinated study of this region, that led to the establishment of the Arctic Institute of North America in 1945, the only organization of its kind on the continent. Incorporated in both Canada and the United States, the institute maintains offices in each country. It is affiliated with the National Academy of Sciences and the National Research Council of the United States. Its board of governors is drawn from many fields of achievement in the United States and Canada, with Greenland represented by a Danish member. Technical relations are maintained with kindred polar groups in other friendly countries. From the point of view of cultural relations alone, the Arctic Institute is doing valuable work in promoting international understanding among scientists.

A topographical survey station at high altitude in the St. Elias Mountains of Canada and Alaska. Photograph by the Arctic Institute of North America.

As a co-ordinating organization, the purposes of the Arctic Institute are to initiate, encourage, support, and advance the objective study of arctic conditions and problems, partly through projects screened by its grants-in-aid committee; to collect, classify and preserve records and material relating to arctic regions; to make such records and material available for pure and applied scientific use by properly qualified individuals and organizations, including government agencies; to arrange for or assist in the publication of reports, maps, charts, and other documentary material relating to the arctic regions; and to establish and maintain close contact with other scientific arctic organizations.

The Arctic Institute has already encouraged and assisted many research projects dealing with man's adaptation to a largely unknown region, including the problem of constructing roads, airfields, and buildings on perennially

frozen ground; weather patterns; communication difficulties; terrestrial magnetism problems, of basic importance to air and sea navigation; the distribution of animals, fishes, insects, and plants, and their economic significance; the maintenance of population of fur-bearing and food-yielding mammals; medical problems; factors determining the improvement of agriculture and its potential in relation to previously unproductive land; geologic structures and other conditions affecting the location of mineral deposits; hydroelectric power, forestry, fisheries, ocean currents.

Other fundamental projects relate to atmospheric electricity, the ionosphere, cosmic rays, and the aurora, certain features of which are of interest in relation to radio communication; the influence on plants and animals of continuous summer sunlight and the dark winters of intense cold; the formation and behavior of glaciers and their relation to climatic cycles of the earth; the effect of these cycles on man's economy. Many aspects of pure science can best be studied in the Arctic, and it is often such basic research, seeking nothing beyond the acquisition of fundamental information about our environment, which promises the richest returns for mankind.

The bulk of the Arctic Institute's efforts logically are devoted to actual field studies. Since its founding, it has sponsored and supported 108 field research projects. These have dotted the Arctic from Alaska through the Canadian Arctic and Subarctic to Greenland, and have ranged from small-scale, specialized investigations to large expeditions covering many aspects of science, and continuing in some cases for years.

In the summer field season of 1952, 14 more projects ranging from anthropology to zoology are being carried out by noted experts in their fields. In a study of past climatic variations and forest migrations, Henry Paul Hansen, of Oregon State College, will continue investigations on the interpretation through pollen analysis of the record of post-ice-age forests in British Columbia and Alaska. Also related to climate is the study by Marjorie C. Findlay on the adoption of sheep farming by Greenlandic seal hunters, a drastic change in Greenland economy brought about by the moderating temperatures of northern Atlantic waters noted during the past 30 years.

Mt. Vancouver, 15,000 feet high on the Alaska-Canada boundary, dominates the Upper Seward Glacier in the foreground; the glacier's nearly level surface covers an area of about 750 square miles. The semipermanent station of the Arctic Institute's Project Snow Cornice is situated on the small rock island (Nunatak) in the right foreground. Arctic Institute of North America photo.

Two 1952 projects are in the relatively new field of glaciology which promises to yield basic information related to climatology, geology, metallurgy, hydrology, and engineering. A study of the great concentrations of northern glaciers and ice-sheets is important if we are to solve the age-old riddle of what causes long-term and short-term changes in climate. One of these glaciological projects is the follow-up study by Maynard M. Miller on the previous investigations carried on by the American Geographical Society on its Juneau Ice Field research project. The other is the comparative study by R. P. Sharp, California Institute of Technology, on the Saskatchewan Glacier in Alberta, where he will make a thorough study of a single relatively simple glacier — its physical condition, rate and mode of flowage, and the nature and origin of structures in the ice produced by this flowage.

Among long-range glaciological programs is the study of the Seward-Malaspina glacier system, astride the Alaska-Canada border, which has been carried on during the past four field seasons by the Arctic Institute's Project Snow Cornice, a glaciological research endeavor that will be resumed in the summer of 1953.

The Arctic Institute is at the present time developing a general long-range research program. More and more, important advances in the sciences are being achieved not by individuals working alone, but by organized group effort. In keeping with this trend, the Arctic Institute stresses the concentration in its field parties of investigators in many branches of science, so that studies in meteorology, geology, botany, anthropology, and biology, based at a single research station, can move forward simultaneously. The field experience gained by the institute in the past five years serves as a valuable guide in the development of such long-range plans.

Much of the research accomplished by the institute to date has been made possible by funds secured under contractual agreement with the U. S. Office of Naval Research and the Canadian Defense Research Board. Additional support has come from industry and other private funds.

In 1948, the Arctic Institute inaugurated its program for associate members as a means of increasing public support for its objectives. Interested persons are admitted to membership on the payment of modest dues, and the institute's research libraries and map facilities are available for their use. The institute now has over 2,000 associates, the nucleus of an interested public to be informed and to inform others.

As a further step toward wider dissemination of information about the North, in 1948 the institute launched its journal, *Arctic*, which carries articles of a scientific nature, as well as discussions of general interest, affording a balance between general and technical material. The journal is distributed three times a year to all associates, and to 224 organizations, including government agencies and departments, universities, scientific societies, and libraries.

The most recent action of the institute in its policy of disseminating scientific information on the North was its publication on June 30th of *Science in Alaska*, edited by Henry B. Collins, of the Smithsonian Institution, a volume of 23 selected papers originally presented at the First Alaskan Science Conference in November, 1950. This book contains an authoritative review of the status of scientific research in Alaska, an appraisal of the major requirements for future research, and suggestions whereby the development and co-ordination of research may be most effectively advanced.

NEW YORK THUNDERSTORM

Although June was not outstanding in local storms, the "thunderstorm of the month" in the New York area was described as one of the most severe in the city's history. During the late morning of June 9th, a squall line moved southeastward from the New York-Pennsylvania mountains toward the city.

At the peak of the storm, the downtown Weather Bureau office clocked a 72 m.p.h. gale for a full minute. During the storm, the downtown temperature dropped 15 degrees from 85°. Small hail was noted in many parts of the city. At La Guardia Field, eight miles to the northeast, a blast of 54 m.p.h. was sustained for a minute, and an intense five-minute rainfall amounted to 0.40 inch with a 15-minute total of 0.75 inch.

This information was supplied by Howard M. Frazier, climatologist at the New York Weather Bureau.

Following a brief warm spell in late April, there was some open mid-channel water in the Yukon, but the river was still frozen fast. Shore ice was strong enough for landings by ski-equipped "bush" planes. The mountain to the left was kept free of snow during the winter by strong valley winds. This scene is about 175 miles upstream from Ft. Yukon. From a Kodachrome by the author.

THE YUKON RIVER BREAKUP OF 1952

ROBERT O. COLE, FAIRBANKS, ALASKA

THE ICE PACK in the Yukon River moved out rather reluctantly this year. In April, a week of warm weather brought about a slight thaw in the upper Yukon Valley; but by the first of May, temperatures were below freezing and the ice was as solid as ever. A gradual rise in temperature during the second week in May plus a few days of warm, sunny weather weakened the ice considerably as snowmelt from the upper Yukon Valley drained into the river. At Ft. Yukon, channel and shore ice broke up and began moving downstream at 8:57 p.m. May 22nd, one of the latest breakups on record.

The ice breakup traveled the remaining length of the river to the Yukon delta on the Bering Sea in 10 days to two weeks, averaging a leisurely five miles per hour. Frequently, heavy slabs of ice three to five feet thick would hang up on sand bars in river bends and block the river flow until enough backwater pressure built up to break the jam. Several ice jams this year were bombed by the U. S. Air Force to prevent the water from backing up and flooding nearby villages.

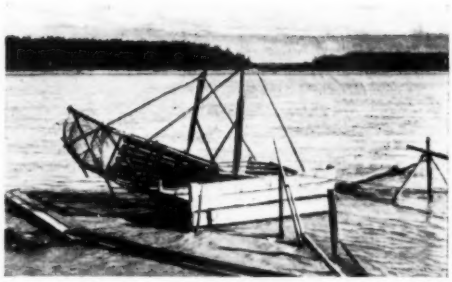
Temperature and precipitation distribution over the upper Yukon Valley control the forces that bring about the annual breakup. During the winter months, the only water entering the river is from hot springs in the upper valley; this provides a flow of water beneath the ice and prevents the mid-channel from freezing to the bottom. With the arrival of warm temperatures in spring, the accumulated snow lying in the Yukon basin melts and sends streams of water into the river, thus greatly increasing stream flow both above and below the ice pack.

As the water from the melting snow drains into the river, certain hydraulic forces are exerted upon the ice. Water running over the ice creates a buoyant force which acts in an upward direction; the swollen stream beneath the ice also exerts an upward force, as

well as one in a downstream direction. When a sufficient amount of water has entered the river, tremendous hydraulic pressure forces the ice to break up into huge sections, often five feet thick.

Ordinarily, April temperatures, especially those toward the end of the month, are sufficiently warm to start a thaw that would force the river ice to break up during the first week or so in May. During April of this year, however, temperatures were below freezing approximately 70 per cent of the time, because cold polar air blanketed the Yukon Valley much longer than usual. Temperatures of −11° F. were observed in mid-April in connection with an outbreak of polar air from Siberia. On two occasions, storms in the Bering Sea and the Gulf of Alaska were able to force the polar air north of the Yukon Valley for a brief period; and temperatures climbed into the 40's and 50's during the day, but dropped below freezing at night. As there was no prolonged thawing during April, the rate of water runoff from melted snow was seriously curtailed.

From the first of May until breakup time, temperatures warmed up gradually as the normal storm track moved slowly northward across Alaska. The weather over the upper



To catch the salmon run, native fishwheels were set in operation along the banks of the Yukon after the breakup. This picture was made at Circle, Alaska, about 90 miles upstream from Ft. Yukon. From a Kodachrome by the author.

Yukon Valley was characterized by alternating clear and cloudy periods, and temperatures were below freezing only a third of the time. After the middle of the month, temperatures climbed above freezing when a high pressure system moved into the Gulf of Alaska and introduced a flow of warm southwesterly air from the Bering Sea into the Yukon Valley. Following a week of steady thawing, the upper Yukon was filled with water, and the tremendous pressure exerted on the reluctant ice pack forced it to break up and float off downstream.

LETTERS TO THE EDITOR

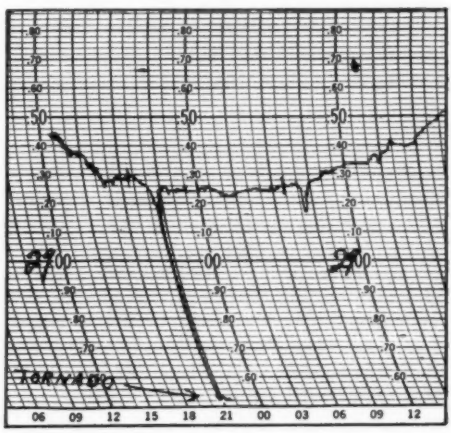
(Continued from page 74)

ly opened immediately to help equalize the pressure in case the station was struck.

The tornado did strike the airport at 8:34 p.m. Accompanying it was an enormous roar as of a train, and after passage the top of the cloud was visible with an orange glow in the upper portions. The lowest pressure indicated on the station barogram was 28.535 with a minus 0.010 correction. The annual mean is 29.660.

A hangar on one side of the station was demolished, along with 29 aircraft. On the other side, a new brick administration building was almost destroyed. All outside weather instruments, power and telephone lines, and the airport beacon were blown down. The communications station itself is constructed of tempered masonite sections anchored in concrete and well braced with steel. Fifty-eight window panes on its western exposure imploded. The emergency power plant was intact, and was used to restore lighting for the station.

Before the passage of the tornado a couple of visitors were placed in a position of relative safety in an eastern anteroom, and during passage I "retired" to another eastern room.



Weatherwise and otherwise, do not underestimate the demoniac fury of a full-grown tornado! It is sincerely hoped that this Spanish word meaning **return** does not fulfill that promise.

E. D. McPHERSON
Airway Operation Specialist
Dyersburg, Tenn.

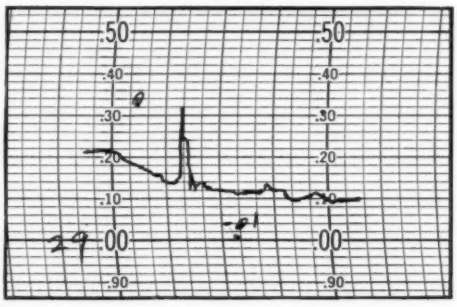
MAY RAINS AND JUNE HEAT

THE ATMOSPHERIC CIRCULATION over the country in May was dominated by a small ridge of high pressure that showed a tendency to persist over the northwestern states. Thus, air flow was from the west-northwest over much of the central and eastern parts of the country, and this was encouraged by a trough of low pressure that lay well off the Atlantic Coast. Colder than normal weather was the rule in this air flow from Iowa north of the Ohio Valley eastward to New England. Elsewhere, the temperature tendency was normal or above. Hot weather dominated the Southwest, and moderately warm conditions prevailed along the Pacific Coast — both areas were in west or southwesterly flow streams.

During the first week, before the month's pattern was fully established, the northern Great Plains had the warmest week on record for so early in the season, and this accentuated the continuing drought in North Dakota and Minnesota. The 60 days ending on May 25th were the driest on record for that area; International Falls, Minnesota, had only 0.01 inch from April 9th to May 25th, the date the drought was finally broken throughout this important wheat-growing country. Precipitation was generally heavy in New England and the Middle Atlantic states and a series of rainy weekends brought gloom to sports enthusiasts. Rainfall was also heavy in the Gulf states, but very light throughout the great agricultural areas of the Middle West — in sharp contrast to the record rains of May, 1951, that led up to the great Kansas flood of June and July last year.

Lake Huron Seiche. A small tidal wave of unusual proportions swept the shores of Lake Huron on May 5th and did considerable damage to lake-shore property. The series of swells, known to meteorologists as a seiche, was apparently caused by a squall line and a pressure jump that passed over the lake in the company of a driving wind and rain storm. At Port Huron, Michigan, where the waves were as high as five feet, the Coast Guard station reported a pressure jump from 29.54 inches to 29.80 inches and then a drop back to 29.45 inches within 45 minutes. Farther north at Alpena, Michigan, a microbarograph made an abrupt rise of 0.18 inch, followed by an abrupt fall of 0.08 inch, and then a somewhat less abrupt fall of 0.12 inch with an unsteady tendency following, as shown on the accompanying tracing. Across the lake in Ontario, a station reported by teletype an abrupt fall of 0.20 inch. Considerable damage was done on the Canadian shore in the vicinity of Owen Sound; at Stokes Bay a bridge over the Stokes River was lifted from its foundations by the surging waters.

Seiches are not uncommon on the Great Lakes, but their nature and causes are not well understood. As a historical note, Bernard Wiggins, of the Buffalo Weather Bureau, reports that a great storm-accentuated seiche struck that Lake Erie port on October 18-19, 1844. The 30-foot waves caused the loss of 47 lives and did considerable damage to the waterfront.



The barograph trace at Alpena, Michigan, during the passage of the seiche.

As May drew to a close, the circulation pattern showed a marked change, with the result that the month of June will be remembered in meteorological history as one of the hottest on record for the eastern two-thirds of the country. The principal feature dominating the air flow all month was the extension of the Bermuda-Azores high pressure area westward until it built up a secondary center of great magnitude and persistence over the Gulf states. The air flow around this great blocking feature was from the southwest; cold fronts found it difficult to penetrate much below the Ohio Valley, and the spell of heat and humidity was constantly reinforced by the flow of warm, moist tropical air northward. As a result the entire country east of the Rockies had much above normal averages, with departures from normal generally near plus 12° or more for three weeks in central sections.

To balance the strong Bermuda high, a trough formed off the Pacific Coast and brought a northwesterly flow into the Far West. Thus, in contrast to the extreme heat to the east, temperatures were well below normal, with many stations reporting their lowest June readings of record. At Medford, Oregon, the month's departure from normal was minus 12°. The mercury dropped to 27° at Klamath Falls, Oregon, and Reno, Nevada, on the 12th and 8.5 inches of snow fell at Joseph, Oregon, on the 11-12. The Rocky Mountain barrier served as the dividing line between western cold and eastern heat.

Florida Waterspout. One of the largest waterspouts ever observed in Tampa Bay formed

early on the afternoon of June 13th and swept ashore in the southside area of St. Petersburg, Florida. There were no casualties, but $75,000 property damage was estimated. The roof was blown off one house and several others were harmed. Considerable damage was done to trees along the shore, and service to over 4,000 users of electricity was cut off by downed tension wires. The spout was observed from the Tampa International Airport by W. W. Talbott, of the U. S. Weather Bureau:

"It was first observed at 12:58 p.m. June 13, 1952, about 15 miles away from our observation point. It was under the overhanging cloud of a thunderstorm—in front and to the west of the thundershower which was moving toward the west. The shower soon cut off the view of the waterspout. According to our appraisal of the synoptic situation, a westward moving line of instability, or squall line, showed up on the Florida east coast along the Daytona Beach-Melbourne stretch at the time of our 7:30 a.m. observation. By 10:30 a.m. it appeared on our Tampa radarscope at Claremont with a north-south axis about 20 miles long. Thereafter we noted a fairly well-marked shower line moving steadily toward the west and approaching Tampa."

Another firsthand description of the spout was reported in the local press by William McIntyre who was on his charter boat in the bay at the time:

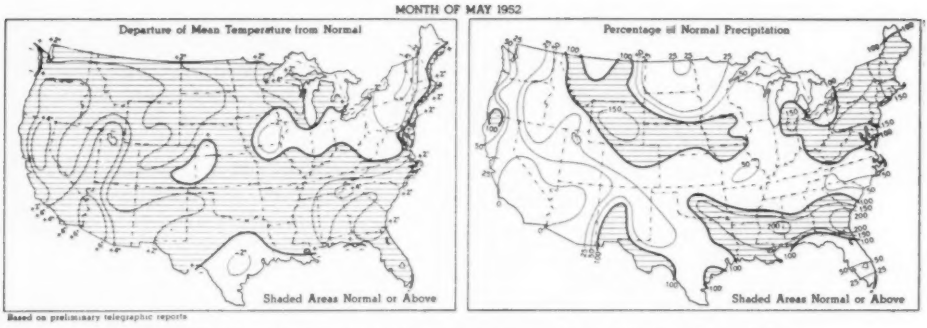
"The spout got larger, the biggest one that I have ever seen. It traveled north to Big Bayou entrance and made a terrific roar as it passed over the shallow water. A wave five feet high was rushing ahead of it. It moved into Big Bayou and crossed over land . . . as it hit land the earth appeared to explode. Trees, sand and all manner of material roared skyward. It disappeared in a mist a few minutes later."

The course of the spout was somewhat twisting but generally on a northerly track, until off Big Bayou it turned abruptly westward and continued in a straight line until it struck land, where a nine-block area of south St. Petersburg was showered with debris. Although winds of 100 miles per hour were estimated by witnesses, the spout dissipated very soon after it crossed the shoreline.

Among the oddities reported were the following: The roof of a house was carried over two blocks and deposited on the roof of another. A piece of wood was driven straight into the stern panel of a power cruiser. And a 7-inch fish was reported to have fallen out of the sky at the time of the spout but 10 miles away!

June Heat Wave. This June was one of the hottest on record for most sections east of the

The Florida waterspout, as it appeared at 1:10 p.m. June 13, 1952. The picture was taken with a Kodak 120 camera at St. Petersburg, by Bob Brzozowski.


MONTH OF MAY 1952
Departure of Mean Temperature from Normal
Shaded Areas Normal or Above
Based on preliminary telegraphic reports
Percentage of Normal Precipitation
Shaded Areas Normal or Above

U. S. Weather Bureau charts for temperature and precipitation, May, 1952.

Rocky Mountains, and in parts of the Southeast it brought the hottest weather for any month since 1925. Many stations broke their all-time absolute maximum records, not only once but several times.

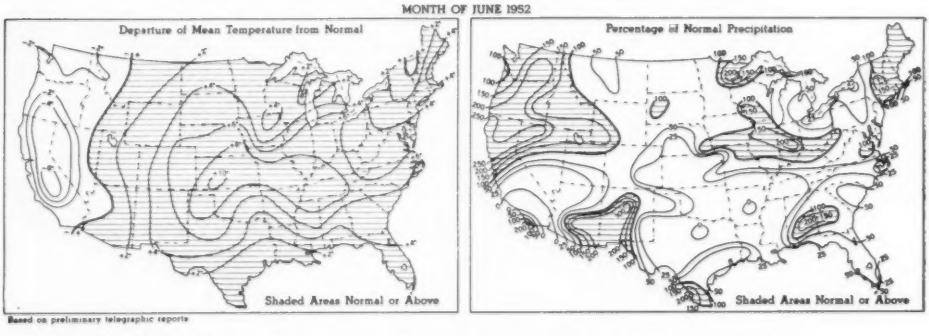
The heat first appeared in the Southwest late in May, and on June 1st 90° and above readings appeared along the Gulf Coast and in Florida, usually a sign that a widespread heat wave is in the making. By the 3rd, readings in the middle 90's were general throughout Kansas and Missouri, and 100° and above occurred a week later in western Kansas and Nebraska. The areas most affected by extreme readings later in the month were farther east: the middle Mississippi Valley, the Tennessee Valley, and the Southeast.

The airport station at Malden, in the extreme southeast corner of Missouri, had the most spectacular readings, according to data received from E. L. Leith, the CAA observer there. From June 3rd through July 3rd, a maximum 90° or above occurred every day. After three successive days of 99° maxima, the mercury topped the 100° mark on the 14th. Thereafter until July 2nd, the maxima were 98° or above on all but one day, with 14 days having 100° or above. The all-time maximum was 108° on the 29th, during a week that saw the average daily maximum at 104.5°. Previous records have not been maintained at Malden, so comparative figures are not available; but since the thermometers are located on an exposed airport and are at a low elevation in the Mississippi Valley, it is likely that Malden will gain prominence in the future on the weather teletype circuit as a hot spot.

St. Louis added to its reputation with the warmest June on record, an average of 84.1°. Daily maxima were broken on eight days. The highest reading during the month was 104.3° on the 28th, which exceeded the previous high of 104.2° set on June 19, 1934, another famous hot month. There were seven days with 100° or higher, one more than in any previous June, according to data supplied to WEATHERWISE by A. A. Rausch, of the local Weather Bureau.

The center of the heat wave drifted slowly eastward from the Middle West and advanced out of the Southeast as the Bermuda high intensified during the middle days of the month. The eastern states had a brief hot spell from the 15th through the 19th with 90° readings in the Middle Atlantic states and again from the 25th through the 27th. One-hundred-degree heat was recorded as far north as New Hamp-

(Continued on page 94)


MONTH OF JUNE 1952
Departure of Mean Temperature from Normal
Shaded Areas Normal or Above
Based on preliminary telegraphic reports
Percentage of Normal Precipitation
Shaded Areas Normal or Above

U. S. Weather Bureau charts for temperature and precipitation, June, 1952.

WORKSHOP FOR WEATHERMEN

An Easily Constructed Remote Temperature-Indicating Device

CLARENCE A. WOOLLUM, USWB AIRPORT STATION
WASHINGTON NATIONAL AIRPORT, WASHINGTON, D. C.

THE INSTRUMENT described in this article, though not endorsed for official readings, is presented for the information of amateur weathermen who may desire an inexpensive and easily constructed device for giving indoor readings of a suitably exposed outdoor thermometer.

A simple arrangement consisting of a microammeter, a radiosonde thermistor, two flash-

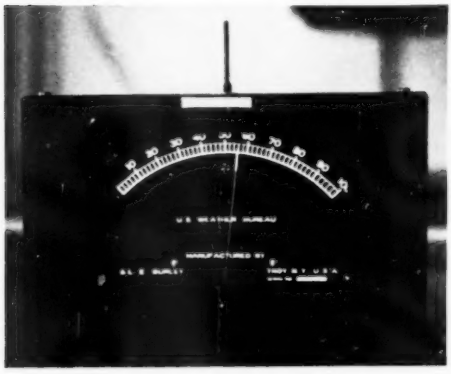


Fig. 1. A photograph of the completed meter circuit housed in a metal box.

light cells, a variable resistor, and hookup wire, makes a reasonably accurate device for remotely measuring outdoor air temperature. The meter, batteries, and resistor can be neatly housed in a metal or wooden box 6″ high, 5″ wide, and 9″ long — as illustrated in Fig. 1.

The thermistor may be exposed outdoors and connected to the meter circuit by a pair of insulated lead-in wires. Locate the thermistor about five feet above the ground (over sod) in a shaded and well-ventilated site protected from falling rain. Accuracy of temperature readings will depend on response and sensitivity of the meter, accuracy of calibration, and thermistor exposure.

The meter used in this design requires 60 microamps of current for full-scale deflection. Meter divisions are printed in increments of 10 divisions from 0 to 100. The smallest printed division represents 2° F. Any microammeter of equal or greater sensitivity with a suitable scale will adapt to the design. Caution must be exercised to avoid damaging the meter, and assembly instructions should be carefully observed. While a new meter can be purchased for about 10 dollars, a bit of searching is required to find a good bargain in a used or surplus meter.

Thermistor. The type used is "Temperature Element ML-376/AM," manufactured by Friez Instrument Division, Bendix Aviation Corporation, Baltimore, Maryland. Other types may be secured, and there are several manufacturers. The cost is about one dollar. Fig. 2 shows a graph of the variation of temperature with resistance for the thermistor used.

Variable Resistor. A wire-wound variable resistor having a resistance range of 0-1,000 ohms was used because it was on hand. The value of the meter shunt resistance is about 380 ohms for the adjustment used. Such a resistor can be purchased for less than a dollar at any radio parts store.

Battery. Two ordinary flashlight cells are used in the circuit; these should be replaced about once a month.

Wire. Ordinary telephone pair or television lead-in will suffice for the connections between thermistor and meter circuit. Ordinary insulated hookup wire can be used in the meter circuit.

Assembly. Mount the meter, variable resistor, and batteries in a suitable box, and wire as shown in Figs. 3 and 4. Make connections to the variable resistor **first,** after ascertaining that the resistor is adjusted to zero resistance between the meter terminals to be connected. Temporarily hook the thermistor across leads to the outside exposure site and adjust the resistor carefully to give a meter reading corresponding to room temperature. Be careful to increase resistance slowly to avoid permanent damage to the meter. Transfer the thermistor to your outdoor site and the meter will read ambient air temperature with approximate accuracy. Se-

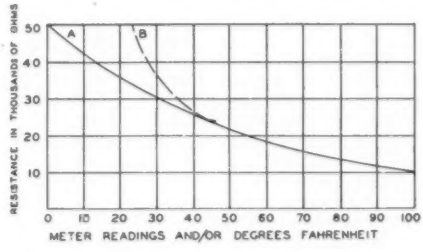


Fig. 2. In this graph, A is the thermistor-temperature-resistance curve; B is the meter-response curve. Note the large corrections required at lower temperatures.

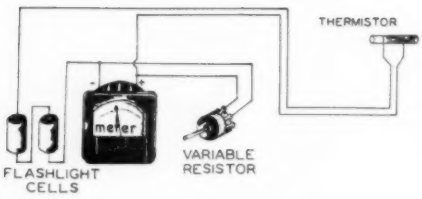


Fig. 3. The arrangement of the parts.

lect a calibration method and determine corrections that are to be applied to meter readings.

Calibration. Fig. 2 is a graph of the thermistor-temperature relationship (solid line). The dashed curve represents the meter response when the thermistor is temporarily removed and the following fixed resistors substituted: 50,000, 40,000, 30,000, 20,000 and 10,000 ohms. Suitable fixed resistors may be purchased at any radio parts store if this calibration method is to be followed. While good agreement exists for the range 55°-100° F., an increasingly larger negative correction is required to the meter reading as the temperature approaches zero. Note that a meter reading of 22 divisions corresponds to a temperature of 0° F.

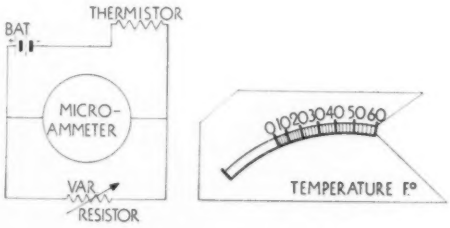
A good thermometer can be exposed alongside the thermistor and corrections established after collecting comparative readings through the indicated range. In larger cities having automatic telephone readings for every hour of the day, the device can be set to agree with official values, with appropriate corrections for various meter values determined on the basis of comparative readings through the range of 0-100° F.

After determining corrections to be applied to meter readings, a new scale may be drawn and pasted over the original meter dial for all, or a portion, of the scale. Fig. 5 shows a corrected meter scale for the interval 0°-60°.

For those interested in the use of thermistors for measuring temperature, the following references are suggested:

1. Hales, W. B., "Thermistors as Instruments of Thermometry and Anemometry." **Bulletin,** American Meteorological Society, **29,** 494, 1948.

2. Seay, P. A., and Gordon, W. E., "Temperature Recording with Thermistors." University of Texas Electrical Engineering Research Laboratory Report No. 16, June, 1948.



Left: Fig. 4, the electrical circuit layout.
Right: Fig. 5, to show how the correction may be applied to the meter scale.

WINDIKATOR

wind direction
wind velocity—
at a glance!

Here's a chance for every amateur weatherman to add to the accuracy of his hobby! WINDIKATOR — a *precision-built*, pocket-size anemometer — gives exact wind direction, wind velocity at a glance! Non-magnetic, rust and corrosion resistant, WINDIKATOR is guaranteed accurate. $9.95. Leather belt carrying case $1.50. Model A indicates velocity 5-30 MPH, Model B, 10-60. If your dealer can't supply you, write . . .

The WINDIKATOR COMPANY
120-W Tremont St. Boston 8, Mass.
Export Division: 15 Moore St., New York 4, N.Y.
Cable Address: "Minthorne"

MAY RAINS AND JUNE HEAT

(Continued from page 92)

shire and central New York State, Atlantic City, New Jersey, and Boston reporting new June records. At Washington, D.C., the night of June 26-27 was the hottest in the 80 years of records at the national capital; a minimum of 82° followed a maximum of 101°. It was hot along the immediate coast, too, with Cape Hatteras reporting its all-time highest temperature in 75 years of records, 97°. In the extreme Southeast it was exceedingly hot. Florida had 105° at Monticello; Augusta, Georgia, had 106°; a station in South Carolina had 108°; and Nashville, Tennessee, reported 106° to equal the all-time high set in July, 1930.

These temperatures were to be matched, however, by those of July, which was to continue hot and humid in the East, records for certain July dates being set as far north as Boston, where 100° was exceeded for the second time in the summer on July 23rd, as this issue of WEATHERWISE went to press.

D. M. L.

Weather Instruments

Farm Rain Gage

No. 510 Direct reading gage fits on any fence post. Made of amber plastic with white graduations. Capacity six inches. Overall length 13 inches. Complete with bracket for mounting. **$4.95**

Standard Rain and Snow Gage

No. 503 United States Weather Bureau type. Funnel is eight inches in diameter. Capacity twenty inches. Brass and copper construction. Stick graduations to 1/100th inches. **$22.50**

No. 504 Support for 503 rain gage. **$12.50**

Sling Psychrometer

No. 208 U. S. Weather Bureau type. Two matched thermometers, 9½ inches long, are mounted on a stainless steel backing. Handle and swivel attached. Range: −20° F. to +120° F. Overall length 12 inches. Complete with tables. **$8.80**

No. 209 Convenient all-metal carrying case for 208. **$2.50**

Official Thermometer

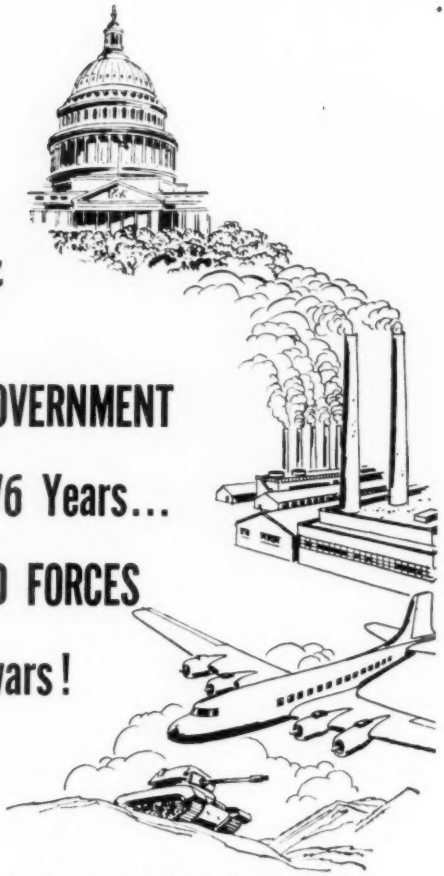
No. 101 U. S. Weather Bureau type. Mercury filled tube 10½ inches long. Graduations etched on stem from −40° to +130° F. Stainless steel backing with brass support. Also available with red spirit tube. **$3.95**

"Everything for the study and practice of weather, professional and amateur. Write for catalogue."

Science Associates

401 North Broad Street **Philadelphia 8, Pa.**

Bendix-Friez



Suppliers to GOVERNMENT and INDUSTRY for 76 Years... to the ARMED FORCES through three wars!

Bendix Friez is part of a great industrial organization whose peace-time potential is being maintained while engaged in vital work for national defense. We are doing our utmost to deliver non-military items such as meteorological instruments, electronic devices, thermistors and a variety of other equipment consistent with our other high priority business.

We invite your inquiries . . . *write Dept. P.*

FRIEZ INSTRUMENT DIVISION of
1324 Taylor Avenue • Baltimore 4, Maryland

Bendix Aviation Corporation

Export Sales: Bendix International Division, 72 Fifth Ave., N. Y. 11, N. Y.